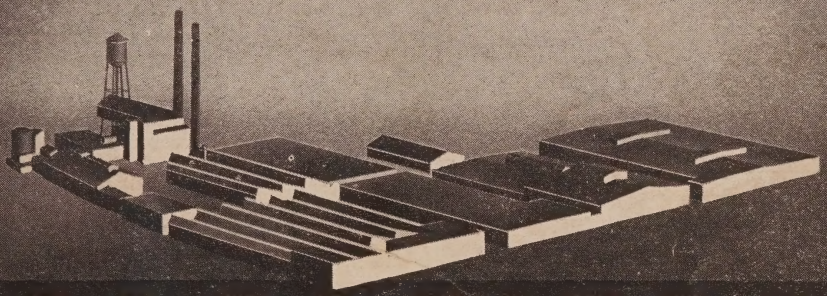
THE CD CAPACITOR



VOL. 3 JANUARY-MAY, 1939 NO. 1

CORNELL-DUBILIER ELECTRIC CORP.
HAMILTON BOULEVARD
SOUTH PLAINFIELD, N. J.

THE C-D CAPACITOR

A Free Periodical Published by

Cornell-Dubilier Electric Corp.
Hamilton Boulevard
South Plainfield, N. J.

and Dedicated to the Job of Providing Helpful and Interesting Reading for Radio Servicemen, Dealers and Technicians.

Joseph Calcaterra, Editor

Printed in U. S. A.

Permission to reprint any of the material in this issue is given to editors of newspapers and magazines, provided due credit is given to the Cornell-Dubilier Electric Corp. Electros or photos will be provided gladly on request. Tear sheets of reprints will be appreciated by the Editor.

Vol. 3 Jan.-May, 1939 No. 1

THE RADIO MAN AND TELEVISION

A careful study of the television stations which are in operation and those which will be in operation in the not too distant future will disclose that for the next year or more the sales and servicing of television receivers will be very limited and will be confined to areas within 25 to 50 miles of the very few television stations in operation in the large centers of population such as New York, Chicago, etc.

Dealers and servicemen outside these areas need not get overexcited until such time as suitable television facilities are made available in their localities.

Counteract Postponement of Purchases

With the press seizing on television as a new feature and playing it up as big news, it is important that dealers and servicemen do their bit to counteract any tendency on the part of prospects for new radio sets to postpone purchases because of a mistaken notion that it will be best to wait to see what develops in the television field.

Aside from the problem of the cost of television equipment and limited service areas, the other problem confronting television station operators is the question of financing the high cost of program material. This problem will no doubt be solved in time but for a while, the limited audience available will make it difficult to interest large advertisers in sponsoring the programs and this means that the number and quality of programs will be limited for some time to come.

Television Pictures Very Good

The quality of picture received by present equipment is surprisingly good, but it is important that we do not get carried away by the excellence of the pictures when the limitations are, at the present time, such a hindrance to the sale of radio apparatus.

For those dealers and servicemen in the areas where television reception is practical, a lucrative business will no doubt be opened up in the form of sales and service jobs on television equipment if, and when, programs reach the point where the public becomes sufficiently interested to invest in the equipment required to receive the programs.

Watch Out for High Voltages

It is well to understand from the very start that television equipment must be handled by men who know, among other things, that in certain portions of the television circuits voltages run up to 1500 to 3000 volts or more.

Capacitors are used extensively in television circuits, and the uninterrupted operation of television receivers will depend largely upon the quality of these high voltage capacitors.

In the field of high voltage capacitors, Cornell-Dubilier stands practically alone, having manufactured, for many years, for other electronic purposes, the largest number of high voltage capacitors ever built in the world.

THE EFFECT OF A. C. ON DRY ELECTROLYTIC CAPACITORS

By Paul McKnight Deeley

Chief Engineer, C-D Electrolytic Division

The past year, for reasons of increased economy and a desire for reduced physical sizes, has seen a large increase in the use of capacitors of the "dry electrolytic" type and employing anode members of the etched (or otherwise roughened) surface types.

The increased use of dry electrolytic capacitors of these types brings up for consideration a point of interest to both design engineer and the Serviceman. This point of interest concerns the behavior of the etched or otherwise roughened surface anode type of dry electrolytic capacitors under various operating conditions in so far as stability of initial capacity values is concerned.

While the standard, polarized type of dry electrolytic capacitor is essentially a direct current device, most circuit applications involve not only the application of a direct current potential to the capacitor but also an alterating current potential which is generally superimposed on the direct current potential. This is particularly the case where electrolytic capacitors are employed in "capacity-fed" filter networks of rectifier-type power supplies. It is the effect on capacity stability of this applied alternating current potential with which this article is primarily concerned.

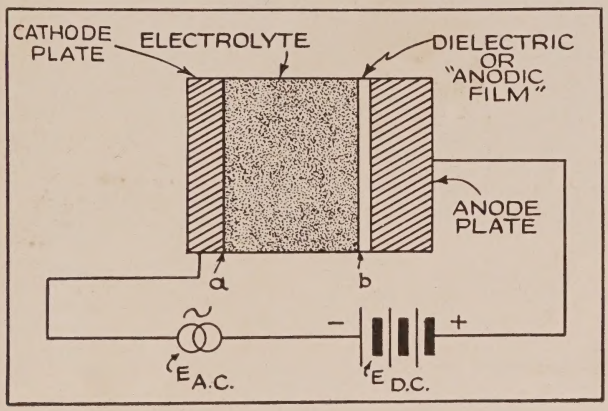


Fig. 1

The essential parts of a dry electrolytic capacitor are:

The anode plate;

The dielectric or anodic film;

The electrolyte or cathode;

The electrolyte contacting plate or so-called cathode plate.

A diagrammatic illustration of a dry electrolytic capacitor, with applied direct current potential and superimposed alternating current potential, is shown in Fig. 1.

It is a basic fact that the electrolyte, in a dry electrolytic capacitor, must have appreciable electrical resistance and that the higher the operating voltage of the capacitor, the higher must be

the resistivity of the electrolyte employed. This being the case, it becomes immediately apparent that when an alternating current flows through a dry electrolytic capacitor structure there will be an alternating current potential difference set up in the resistance path of the electrolyte, between points (a) and (b) of Fig. 1.

The magnitude of this potential difference is proportional to the product of the resistance of the electrolyte path, times the value of alternating current flowing through the capacitor structure. The polarity of this potential difference on one half-cycle is such that the cathode plate is negative with respect to the electrolyte contacting it but on the other half of the cycle the polarity is reversed and the cathode plate becomes positive with respect to the electrolyte contacting the surface of the plate.

Under this latter condition, and if the cathode plate is of a film-forming material, the surface of the cathode plate will acquire an "anodic film." The thickness of this film will be proportional to the magnitude of the positive polarizing potential. Due to the fact that, in modern practice, the cathode

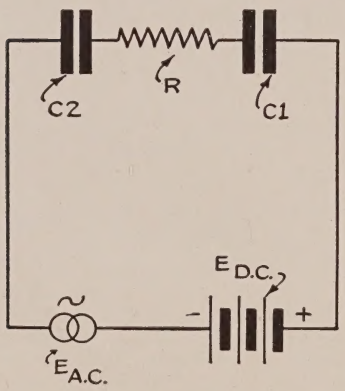


Fig. 2

plate is always of aluminum and therefore film-forming, the cathode plate acquires an anodic or dielectric film.

As soon as the surface of the cathode plate acquires this anodic film the entire capacitor changes from the original polarized structure to a semi- or non-polarized structure and the result, electrically, is that we now have 2 capacities in series. This condition may be represented by the circuit diagram in Fig. 2.

In this diagram C_1 represents the initial capacity of the capacitor and the capacity of the anode plate and electrolyte, while C_2 represents the capacity of the cathode plate and the electrolyte. The resistance of the electrolyte path from (a) to (b), in Fig. 1, is represented as R.

As 2 capacities in series now exist, the total capacity of the entire structure becomes less than the original capacity as represented by C_1. The new capacity value is then equal to $\frac{C_1C_2}{C_1 + C_2}$.

As the capacity of an electrolytic capacitor is proportional to the area of the surface of the anode and the thickness of the dielectric or anodic film, and the thickness of the dielectric film is proportional to the magnitude of the anodic polarizing potential, then the value of C_2 must be proportional to the value of the anodic polarizing potential applied to the cathode plate. From this it can be seen that, the higher the value of such a potential applied to the cathode plate, the less will be the value of C_2 and therefore the greater the reduction in over-all capacity of the entire structure.

Where the anode and cathode plates of a dry electrolytic capacitor structure are both of plain-surface aluminum foil, alternating current of considerable magnitude may be passed through the condenser without causing a materially detrimental reduction in initial capacity values. To illustrate the actual effect, reference is made to curve A in Fig. 3.

Curve A.—In this curve, the values of resultant capacity are plotted against peak values of superimposed alternating current potential. The capacitor used for il-

lustrative purposes is a 10 mf., 150 working volt type.

If, in a 10 mf. 150 working-volt structure, an etched-surface anode is employed, the actual surface area of the anode remains the same but its physical size is reduced. Such a reduction in physical size results in a corresponding reduction in the physical size of the cathode plate. Due, however, to the fact that the cathode plate is of plain surface a reduction in surface area is also obtained. If, for example, the etched anode plate has a surface area increase or gain of 5 times that of plain foil, the actual surface area of the cathode plate will be reduced 5 times. In the etched plate structure therefore, for a given applied alternating current potential the value of C_2 (in Fig. 2) will be reduced to 1/5th the value of capacity obtained with the plain foil cathode structure. To illustrate the over-all effect of this condition, reference is made to curve B in Fig. 3.

Curve B.—In curve B, the resultant values of over-all capacity are again plotted against peak values of superimposed alternating current potential.

It should be obvious by this time that should a 10 mf., 150 working-volt structure be fabricated with an anode having a surface area gain of, say 10 times, the effective reduction in original capacity value will be proportionately greater for any given value of superimposed alternating current potential. See Fig. 3, curve C.

Curve C.—It can be seen that, with the higher anode surface area gain structures, a material reduction in original capacity values will result from superimposed alternating current potentials of appreciable magnitude.

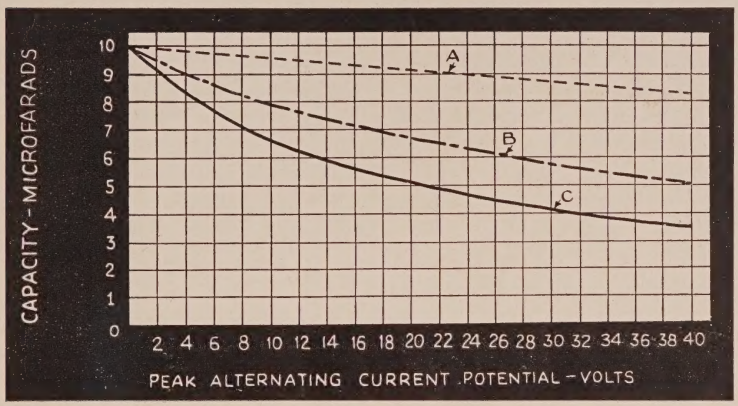


Fig. 3

Such a condition may frequently be serious in radio receiver circuits in the form of (1) increased hum due to reduced capacity in filter circuit applications and (2) instability in bypass applications of dry electrolytic condensers.

There is a remedy, however, in the form of two procedures which insure more stability of initial capacity values.

(1) The first and most practical is to employ a cathode plate which is etched or otherwise treated so that its surface area is equal to that of the anode plate. When this condition is obtained the effective reduction in initial capacity value becomes the same as is graphically shown in curve A. If the cathode surface area is greater than the anode surface area the capacity stability of the capacitor structure

(Continued on Page 15)

THE MEETING PLACE

Wherein We Introduce To You the Men Who Serve You at C-D Headquarters

CHARLES H. CAINE
Vice-President
In Charge of Mid-West Sales

The career of Charlie Caine might well have furnished the inspiration for one of Horatio Alger's famous stories.

Born in humble circumstances and obtaining only a limited education in Chicago's public schools, he rose, by dint of hard work, straight thinking and his extraordinary faculty of making loyal friends, to the topmost rungs of the ladder of business and financial position.

Upon leaving school he obtained a job as an office boy and soon after branched out as a representative in the Chicago district for several manufacturers of raw materials. He was active as a sales representative from 1903 to 1907. In 1908 he entered into partnership in a small business manufacturing automobile ignition parts.

During the period of 1911 to 1930, during which time he served as President and Director of Brown & Caine, Inc., the company rose to the position of one of the largest manufacturers and distributors of automobile replacement parts in the world.

In 1929 he sold his interest in Brown & Caine, Inc. to the Tung-Sol Lamp Works, but continued as President and Director of Brown & Caine, Inc. and later of Tung-Sol Condensers, Inc. when the firm name of Brown & Caine, Inc. was changed to Tun-Sol Condensers, Inc. in 1931.

In 1932 he was made Vice-President of the Cornell Electric Mfg. Co., Inc. and in 1933 he became Vice-President in Charge of Mid-West Sales for the Cornell-Dubilier Electric Corp.

Pioneer in Capacitor Field

Charlie Caine still speaks with pride of his pioneering work in the development and manufacture of filter blocks for A.C. sets and the development of oil capacitors in so-called "sardine" cans.

In 1931 shortly after the sale of his stock interest in Brown & Caine, Inc. to Tung-Sol Lamp Works he played with the idea of retiring and even went so far as to go to California for a few months. But the "retirement" idea did not stick. Years of constant activity made retirement impossible for him to stand and shortly after he came back East to join the Cornell Electric Mfg. Co., Inc. as Vice-President.

A Good "Mixer"

Charlie Caine has always had a host of friends with whom he does business, plays golf, fishes and to whom he serves his justly famous "El Cobra" cocktail (a powerful jag-producer, consisting of grapefruit cells, bourbon, bacardi and grenadine).

He is a member of the Olympia Fields Country Club; can always be found at every R.M.A. Golf Tournament; plays golf in the low 90's and can tell fish yarns with the best of them.

RESCO STRESSES QUALITY AND SERVICE

The Radio Electric Service Co., with main offices at 7th and Arch Sts., Philadelphia, Pa., is one of the most progressive jobbers in the country.

The business, started in the early crystal set days of radio, has expanded and prospered steadily until now it boasts of several popular branches within a radius of 100 miles of the main store at Philadelphia.

The organization, headed by Mr. John Stern, ably assisted by Mr. Gene Rothman and Mr. Maury Green, has been built on the firm foundation of quality merchandise and courteous, efficient service.

Mr. Stern attributes much of the success of the business to the loyalty and efficiency of the store managers, whom he has selected with utmost care, and to strict adherence to a policy of fair play and service to their customers.

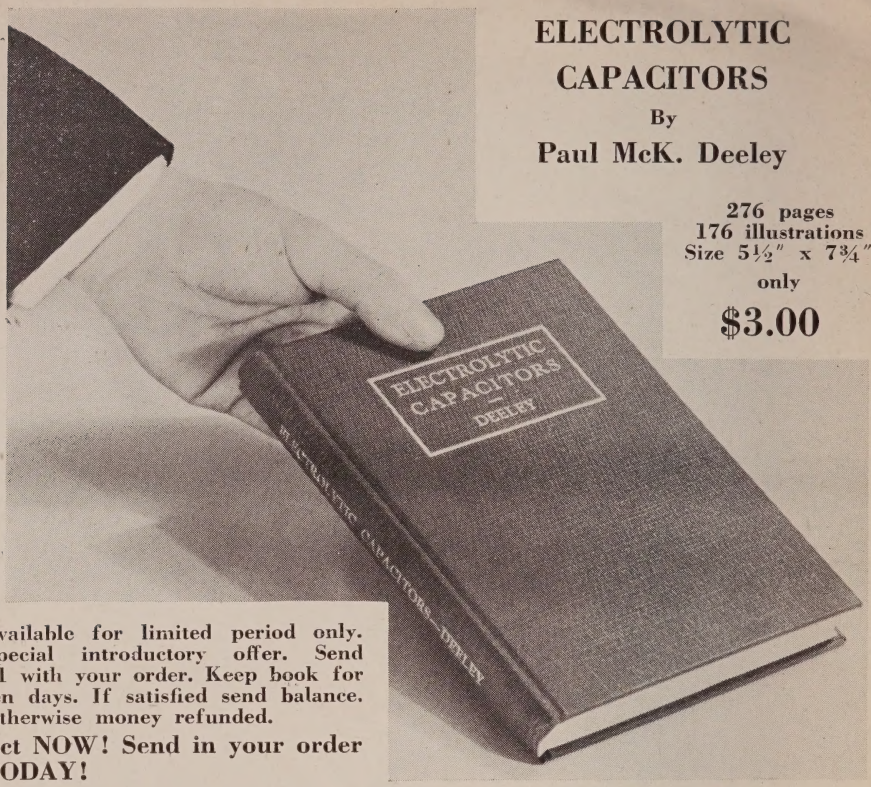
ELECTROLYTIC CAPACITORS

By

Paul McK. Deeley

276 pages
176 illustrations
Size 5½" x 7¾"
only

$3.00



Available for limited period only. Special introductory offer. Send $1 with your order. Keep book for ten days. If satisfied send balance. Otherwise money refunded.

Act NOW! Send in your order TODAY!

AUTHORITATIVE FACTUAL — INFORMATIVE ACCURATE — UNDERSTANDABLE COMPLETE

TAKE ADVANTAGE OF THIS MONEY BACK GUARANTEE!

Cornell-Dubilier Electric Corporation,
South Plainfield, N. J.
Gentlemen:

Please send me a copy of the new book "Electrolytic Capacitors" by Paul McKnight Deeley. Enclosed is $1.00 in part payment. If I decide to keep it I shall remit the balance of $2.00 within 10 days. If I decide not to keep it I shall return the book and you will refund my dollar.

Name .....

Address .....

City ..... State .....

Occupation .....

Employed by .....

CONTENTS

CHAPTER I

ELECTROLYTIC CAPACITORS 3

Construction of Matter. Solids. Liquids. Gases. Molecules. Atoms. Electrons. Conductors. Insulators and Dielectrics. Electrical Capacitors. Capacity. Capacity Calculation. Electrolytic Capacitors. The Metal Oxide Film. Types of Electrolytic Capacitors.

CHAPTER II

BASIC THEORY OF OPERATION OF ELECTROLYTIC CAPACITORS 8

Film Forming Metals. Aluminum. The Electrolytic Cell. Aluminum Oxide Dielectric Film. Capacity Relationship. Cause of Polarization. Cause of Leakage Current. Electron Emission. Voltage Gradient. Structural Limitations. Sparking Voltage. Design Factors.

CHAPTER III

TYPES OF ELECTROLYTIC CAPACITORS

Wet Type. Component Parts. Containers. Physical Sizes. Container Covers. Vents. Mountings. Anode Structures. Anode Supports. Stem Bushings. Stem Seals. Terminals. Separators. Electrolytes.

CHAPTER IV

THE FABRICATION OF WET ELECTROLYTIC CAPACITORS

Anodes. Plain. Etched. Etching Methods. Chemical Etching. Hydrochloric Acid Etching. Copper Chloride and Hydrochloric Acid Etching. Copper Chloride Etching.

CHAPTER V

FORMATION OF ANODIC FILMS

Cleaning of Anode Assemblies. Cleaning of Plain Surface Aluminum. Sodium Hydroxide and Nitric Acid Method. Sodium Carbonate Method. Potassium Dichromate and Sulphuric Acid Method. Cleaning Etched Surface Aluminum. Sodium Borate Method. Potassium Dichromate and Sulphuric Acid Method. Anodic Film Formation. Formation Electrolytes. Sulphuric Acid Formations. Oxalic Acid Formations. Active and Inactive Anodic Films. Boric Acid and Sodium Borate Formations. Still Formation. Continuous Formation. Relationship of Anode Area and Capacity. Fill Electrolytes. Electrolyte Resistivities. Low Temperature Electrolytes.

CHAPTER VI

AGING AND CHARACTERISTICS OF WET ELECTROLYTIC CAPACITORS 30

Aging. Electrical Characteristics. Effects of Temperature. Idle Shelf Life. pH Values of Fill Electrolytes. Life. Operating Limitations. Alternating Current Components. Chromium Plated Containers. Regulating Types. Regulation.

CHAPTER VII

THE DRY TYPE OF ELECTROLYTIC CAPACITOR . . . 36

History. Basic Construction. Windings. Anode and Cathode Foils. Tabs. Anode Plate. Cathode Plate. Separators. Paper. Gauze. Cellophane. Electrolytes.

CHAPTER VIII

THE FABRICATION OF DRY ELECTROLYTIC CAPACITORS

Anode Foils. Plain. Etched. Etching Procedure. Solution Concentrations. Temperature Effects. Cleaning Methods. Continuous Etching. Electrochemical Etching. Metal Clad Anodes. Characteristics of Metal Clad Anode Structures.

CHAPTER IX

FORMATION OF THE ANODIC FILM 46

Still Formation. Forming Tanks. Continuous Formation. Voltage Gradient. Multiple Formation. Formation Electrolytes. Voltage Limitations. Relationship of Anode Area and Capacity. Rated Voltage and Formation Voltage.

CHAPTER X

NON-AQUEOUS ELECTROLYTES AND THEIR CHARACTERISTICS 52

Electrolyte Structures. Fillers. Organic Acid Types. Aliphatic Acids. Aromatic Acids. Acid Salts. Solvent Types. Hydroxy-alkylamines. pH Values and Conductivities. Boric Acid and Glycol. Glyco-Ammonium Borates. Resistivity Factors. Boric Acid Content. Ammonium Content. Boiling Point Temperatures. Scintillating Potentials. Plastic and Resinous Types of Electrolytes.

CHAPTER XI

WINDING AND IMPREGNATION OF DRY ELECTROLYTIC CAPACITORS 62

Windings. Soak Impregnation. Vacuum Soak Impregnation. Hand Pasting. Machine Pasting. Hydrostatic Impregnation. Separator Limitations. Centrifugal Force and Centrifuges.

CHAPTER XII

TYPES OF DRY ELECTROLYTIC CAPACITORS . . . 68

Polarized and Non-Polarized Types. Multiple Section. Common Cathode Concentric Windings. Common Anode Structures. Limitations. Containers. Cardboard Tubes and Boxes. Aluminum Cans. Terminals. Methods of Mounting.

CHAPTER XIII

CHARACTERISTICS AND AGING OF DRY ELECTROLYTIC CAPACITORS 74

Electrical Characteristics. Temperature and Leakage Current. Temperature and Capacity. Temperature and Voltage Breakdown. Temperature and Equivalent Series Resistance. Direct Current Leakage. Regulation. Equivalent Series Resistance. Separator Thickness. Radio Frequency Characteristics. Idle Shelf Life. Leakage Recovery. Active Life. Over Voltage Breakdown. Aging.

CHAPTER XIV

TESTING OF ELECTROLYTIC CAPACITORS 82

Fundamental Relationships. Impedance. Phase Angle. Phase Difference. Power Factor. Measurement of Direct Current Leakage. Circuit Net Works. Regulation. Leakage Recovery. Scintillating Voltage. Measurement of Capacity. Equivalent Series Resistance. Impedance Measurement of Capacity. Bridge Measurements. Bridge Circuit Networks. Resistance Substitution. Determinations of Capacity and Equivalent Series Resistance. Applications of Electrolytic Capacitors.

CHAPTER XV

RECTIFIERS AND FILTER CIRCUITS 92

Rectifiers. Half Wave. Full Wave. High Vacuum Type. Mercury Vapor Type. Limitations. Bridge Circuit. Voltage Doubling Circuit. Current Doubling Circuit. Filters. Low Pass Filters. Attenuation. L Type Filters. Filter Characteristics. Attenuation of A.C. Component. Effect of Power Factor. Multiple Section Filters. Low Voltage Rectifiers. Copper Oxide Rectifier. Chemical Rectifiers. Tungar Rectifier. By-Pass Capacitor Applications. Voltage Multiplication.

CHAPTER XVI

ALTERNATING CURRENT TYPE OF ELECTROLYTIC CAPACITORS 102

Non-polarized Cell. Theory. Voltage Distribution. Energy Relationship. Basic Construction. Fabrication. Anode Members. Capacity Relationships. Separator Material. Electrolytes. Containers. Aging. Testing. Measurement of Capacity and Power Factor. Characteristics. Effects of Temperature on Capacity and Power Factor. Over Voltage Effects. Idle Shelf Life. Accelerated Tests. Application of A.C. Electrolytic Capacitors. Capacitor Motors. Basic Circuits. Capacity and Torque. Power Factor and Torque. Operating Limitations. Container Constructions.

CHAPTER XVII

APPENDIX OF USEFUL INFORMATION . . . 114

Measurement of Peak Voltages. Resistivity Measuremems. Audio Frequency Impedance Determinations. Radio Frequency Impedance Determinations. Conduction of Life Tests. Metric Equivalents. Temperature Conversion Factors. pH Values of Acid and Bases. pH Values of Indicators. Melting Points of Waxes and Resins.

INDEX

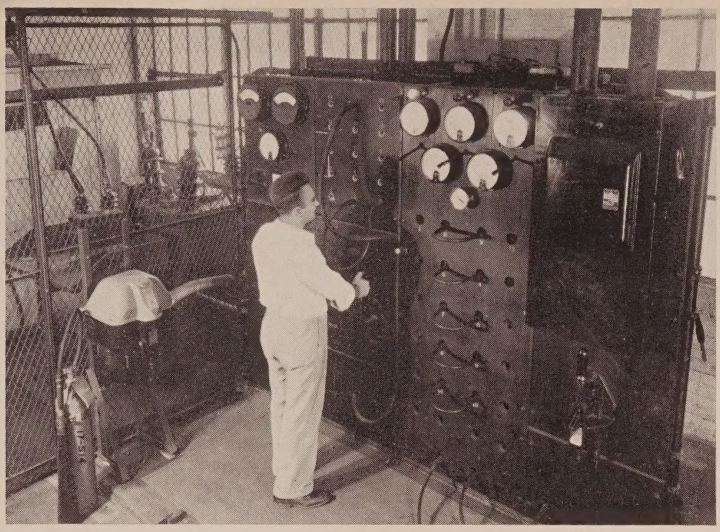
NEW QUIETONE INTERFERENCE FILTERS

The SUCCESS of C-D QUIETONE INTERFERENCE FILTERS was so great, so immediate and widespread that Cornell-Dubilier engineers set to work expanding this fine filter line. Today we announce the New Quietone Interference Filters. Now there is a C-D Quietone unit to meet every conceivable radio interference filter requirement.

For complete details on the twenty-two C-D Quietone Interference Filters now available, send for Catalog No. 166-A, FREE on request.

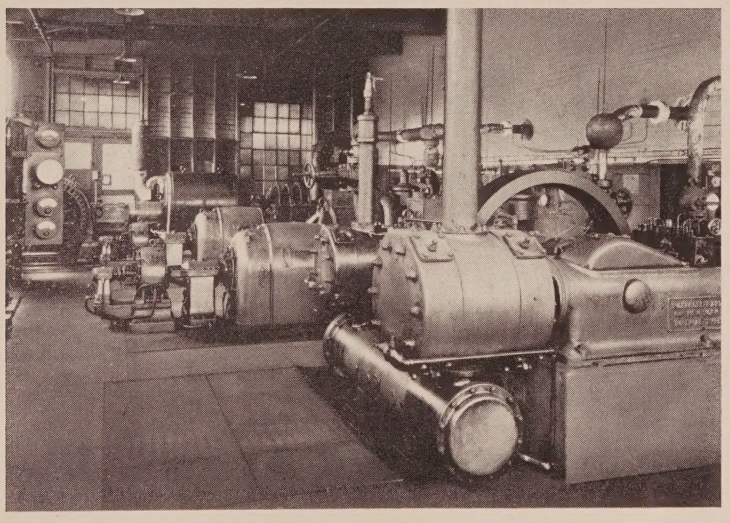
CORNELL-DUBILIER ELECTRIC CORPORATION

1000 Hamilton Boulevard, South Plainfield, New Jersey



A VIEW OF THE C-D HIGH-VOLTAGE TEST ROOM

A capacitor unit under test may be seen at the left center of the photograph, behind the screen and just below the terminals of the test transformer.



A PEEK INTO THE C-D 1500 KV-A. POWER HOUSE

Reciprocating pumps, which supply the air pressure required for manufacturing operations as well as for the deep wells that supply the plant with water, are shown in the foreground in addition to the generators and turbines.

THE READING GUIDE TO CURRENT RADIO MAGAZINES

A Listing of the Most Instructing and Interesting Articles Appearing in Recent Radio Trade and Service Publications

COMMUNICATIONS—April 1939

19 East 47th Street, New York, N. Y.

A Standard VI & Reference Level. Pages 10, 11.
The Automatic Telegraph. Pages 12, 13, 16
Chart of Microphone Chracteristics. Pages 14, 15.
Fundamentals of Television Engineering. Pages 17-19.
Kinescopes for Television Receivers. Pages 20, 21.
Television Economics. By Alfred N. Goldsmith. Pages 26, 27.
Recorder Characteristics. Page 41.

* * * *

ELECTRONICS—April 1939

330 West 42nd Street, New York, N. Y.

Cathode-Ray Amplifier Tubes. Pages 9-11.
Recent Tube Applications to Automobile Making. Pages 12-15.
Pressure Capacitors. Pages 16-19.
Power for Television Receivers. Pages 22-24.
The Permatron and Its Application in Industry. Pages 25-28.
Revised U-H-F Allocations. Page 34.

* * * *

PROC. OF IRE—April 1939

330 West 42nd Street, New York, N. Y.

Receiver with Automatic Selectivity Control Responsive to Interference. Pages 239-244.
Radiotelephone System for Harbor and Coastal Services. Pages 245-253.
Remotely Controlled Receiver for Radiotelephone Systems. Pages 264-269.
Transient Response of Multistage Video-Frequency Amplifiers. Pages 227-284.

* * * *

QST—May 1939

West Hartford, Conn.

Exploring Below One Meter. Pages 16-18.
A Long-Distance Receiving Set That Really Tunes. Pages 19-21.
A Three-Element Rotary Beam for $16.61. Pages 26, 27.
Preselection Pointers. Pages 30-33.
Input Resistance of R. F. Receiving Tubes. Pages 41-43.
Wave-Shape Plots for Checking Amplifier Distortion. Pages 50, 51.

* * * *

RADIO—May 1939

7460 Beverly Boulevard, Los Angeles, Calif.

Coverter Design. Pages 9-16.
A 100-Watt Transmitter With Four-Stage Bandswitching Exciter. Pages 17-20.
Construction of Plywood Radio Towers. Pages 21-23.
Multi-Wire Doublet Antennas. Pages 24-25.
Conquering the Q. Pages 31-33.

* * * *

RADIO DIGEST—May-June 1939

7460 Beverly Boulevard, Los Angeles, Calif.

A Terrain Clearance Indicator. Pages 4-12.
Pedro the Voder, a Machine That Talks. Pages 22, 23.
Demonstration of Frequency Modulation. Pages 24-31.
The Transitron Oscillator. Pages 34-46.
Microphone Ratings. Pages 47-50.
Inductive Tuning, Theory and Application. Pages 55-59.
Transmitter Safety Technique. Pages 60-69.

* * * *

RADIO-CRAFT—May 1939

99 Hudson Street, New York, N. Y.

How to Build a High-Fidelity 5-Watt Versatile Amplifier. Page 649.
Emergency Network Patrols State Highways. Pages 650, 651.
Intermodulation—And Its Relation to Distortion. Pages 652, 653.
Sound-On-Wire Tape. Pages 654, 655.
48 New Tubes. Pages 656-659.
D.C. to A.C. Conversion—Using Polarity Changers. Pages 660, 661.
Complete Step-By-Step Dynamic Servicing. Page 662.
An "Octave-Resonance" Multiple Air-Column Baffle. Pages 664-665.
Speaker Placement in Public Address Work. Pages 668, 669.

* * * *

RADIO NEWS—May 1939

608 S. Dearborn Street, Chicago, Ill.

Television Grows Up. Pages 6-10.
Build Your Own Video-Audio Set. Pages 12, 13.
Construct a Tube Tester. Pages 22-24.
A Useful Test Panel. Page 35.
A Remote Record Player. Page 37.
Serviceman's Case Histories. Pages 40, 41.

* * * *

RADIO RETAILING—April 1939

330 West 42nd Street New York, N. Y.

More About Sound License and Permits. Page 20.
6 Steps to a Sale. Pages 22, 23.
Modernize to Make Money. Page 26.
Map of Television Stations in U. S. Pages 32, 33.
Practical Television Installation Problems. Page 40.
Television—How It May Be Sold. Pages 50, 51.

(Continued on Page 15)

THE RADIO TRADING POST

A Free Market-Place Where Sellers, Buyers and Swappers Can Meet to Their Mutual Advantage

This department, a regular feature of The C-D Capacitor, is designed to help readers who wish to buy, sell or trade radio material with other readers.

These advertisements are listed FREE of charge to C-D readers so if there is anything you would like to buy or sell; if you wish to obtain a position or if you have a position to offer to C-D readers, just send in your ad.

These columns are open only to those who have a legitimate, WANTED, SELL or SWAP proposition to offer. The Cornell-Dubilier Electric Corp. reserves the right to edit advertisements submitted, and to refuse to run any which may be considered unsuitable. We shall endeavor to restrict the ads to legitimate offers but cannot assume any responsibility for the transactions involved.

Please limit your ad to a maximum of 40 words, including name and address. Advertisements will be run as promptly as space limitations permit.

POSITION WANTED—Young, reliable, married man. 4 years experience radio and electrical repair, radio store. Trained with Radio and Television Institute. Interested in all electrical and air condition work. Consider anything with advancement. Howard Faneuf, Oxford, Mass.

POSITION WANTED—As police radio operator or installing and, or demonstrating police radio equipment. Have telephone second license; over 10 years radio experience; have car; will travel. S. Pokorny, 702 Cleveland St., Watertown, Wisc.

POSITION WANTED—Radio engineer, specialist in amplifier design and manufacture. Studied communication engineering at RCA Institute. Formerly employed by RCA Communications. Experienced in design, development and construction work. Creative ability. Want any type radio work. Salary optional. M. Tatarsky, 318 E. 9th St., New York, N. Y.

POSITION WANTED—As apprentice, age 18, will work for as much as you think I am worth. Good knowledge of radio theory; want experience in any phase of radio; very ambitious and good worker. Just want opportunity. References. Joseph Depraida, 1073 First Ave., New York, N. Y.

POSITION WANTED—By graduate of Coyne Radio School. Will consider job in the sales or service department of reputable organization. South preferred. Averaged 93.7 in Coyne Radio School. References furnished. J. C. Boss, R No. 2, Auburn, Ga.

POSITION WANTED—Young man, 26, graduate RCA Institutes Resident Service Course. Would like opportunity to gain further experience in practical service work. Salary secondary. John J. Zazula, 906 N. Springfield Ave., Chicago, Ill.

FOR SALE OR TRADE—Triplett Model 1230 All-wave signal generator, new condition.

WANTED—Service Manuals. Herbert Duggan, Box 203, Almont, Mich.

FOR SALE OR TRADE—Radio Engineering and Projection Engineering Magazines.

WANTED — IRE Proceedings; Riders Manuals 6, 7, 8, 9. Donald G. Buck, 43 Hagen Ave., N. Tonawanda, N. Y.

FOR SALE OR TRADE—Velocity mike; crystal mike; Weston meters; RCA test oscillator; 7-tube amateur set; Xmitting parts, etc.

WANTED—16M Movie films and projector. Write for big swap list. Stanley J. Nicewicz, 79 Church St., Broad Brook, Conn.

FOR SALE OR TRADE—National Radio Institute Course in Radio Servicing, on or for PA equipment, a 20 to 30 watt amplifier preferred. Emil F. Hajny, Fairfield, Nebr.

WANTED—Hickok oscillator Model OS 10 or any Hickok all-wave oscillator; also electric drill; condenser tester or analyzer. W. E. Wolcott, Beacon Radio Shop, 352 James St., Utica, N. Y.

FOR SALE—New 25-cycle transformer, 10-12 tubes, 700 v. at 135 ma., 6.3 v. at 6.5 ma., 5 v. at 3 ma., $2.50.

WANTED—Philco battery re'cd model 37-643 or 38-643 with tubes, less cabinet and battery; also Super Skyrider re'cd sx16 or sx17. State lowest cash price. John Kozma, 337 E. 13th St., New York, N. Y.

WANTED—2" Cathode ray oscillograph; Simpson Model 28 universal multimeter; communication receiver with Xtal filter; 500 watts phone rig complete; RCA code records; RCA battery oscillator No. 97A, 97B. TMV97C, 9595, or oscillator coil No. 9559. State lowest cash price and condition. Victor Kozma, 337 E. 13th Street, New York N. Y.

WANTED—Metal locator for Manila firm. Please send description, quotation, list and retail price. Inform about the working DEPTH in sand. Bela Gati, 105 South Fulton Ave., Mount Vernon, N. Y.

WANTED—Scott 30-tube receiver; describe fully and state cash price.

FOR SALE OR TRADE—Hallicrafter 58A Amateur communication Superhet receiver, like new; Universal BB microphone; Oil filter condensers; Triplett tube tester, 1 year old. Oliver F. Klein, c/o OK Radio Service, 2235 W. 39th Street, Milwaukee, Wisc.

WANTED—Used outboard motors, any make or model. Condition not important. Parts or wrecked motors. Quote price. John N. Dangelzer, 311 W. Atlantic Ave., Albuquerque, N. Mex.

FOR SALE OR TRADE—RCA 104 and 105 amplifier and speaker; Ranger oscillator; GE 24/1500 volt dynamotor; Bodine 110 d.c. to 110 a.c. MG set; 35 MM M.P. projector; outboard motor.

WANTED—Test equipment and manuals; 16mm and 35mm sound projector and camera. Hansen Radio Service, Niles, Mich.

WANTED — Movie equipment, 16mm, with or without sound; amplifying equipment and accessories; also still type photography equipment cameras and enlargers. Chatham Radio Service, Bull & Victory Drive, Savannah, Ga.

FOR SALE—Three 6-foot Racon all-metal trumpets, A1 condition. Jack Levine, 625 Main St., Worcester, Mass.

FOR SALE OR TRADE—Balkite "B" eliminator and tube rejuvenator; also some tubes. Will trade for small 2 or 3 tube short-wave set. John Stansberry, 227 So. Moore, Ottumwa, Iowa.

FOR SALE—One Rider's combined vols. 4, 5, 6 Radio Service Manuals in perfect condition. M. A. Porter, Ideal Radio Service, 1713 Larrabee St., Chicago, Ill.

FOR SALE—Supreme signal generator, model 581, used very little, sacrifice for $40. Also Bruno Velotron microphone Model MB; high impedance 25' cable, $10. August L. Oechsli, 40 Bradford St., Brooklyn, N. Y.

WANTED—Service manuals and test equipment. Cash. Describe instrument and state price. R. W. Tiner, Tiner Radio Shop, Fort Payne, Ala.

FOR SALE OR TRADE—Supreme model 85 tube tester, takes 4, 5, 6, 7 prong tubes, $5.00; perfect condition. H. A. Zeitler, PO Box 72, Luxemburg, Wisc.

WANTED—Late, up-to-date radio course; Rider's or Gernsback's service manuals; radio books and magazines, testing equipment of all kinds; socket-selector, adapters, meters. Cash. Wesley Kay, 319½ Main St., Niagara Falls, N. Y.

FOR SALE OR TRADE—One kilowatt, three band transmitter, all power supplies, four xtals, bug, all tubes, Gammatron, final, $100. or good piano accordion. John R. Kesselring, W8JMJ, RFD Nr. 2, Marion, Ohio.

FOR SALE—Rider's vols. 1, 2, 3; guaranteed perfect, $15. Supreme analyzer model 91 in perfect condition, $20. Ghirardi No. 1 and 2, $6.; Resistance measurement, Rider, $1.50; Cathode Ray Tube at Work, Rider, $2.00. Sidney Block, 846 Freeman St., Bronx, N. Y.

FOR SALE—GE No. 390A, 600/8 v. d.c. airplane generator, $3.50; Baldor C3 1/8 HP condenser a.c. motor, $5; Wing transceiver, 2½ and 5 meter, $4; REL No. 278 ham receiver-coils-speaker and a.c. power supply, complete $10.; Conn nickel-finish tenor sax and case, $30.; WE¼ HP 3450 RPM a.c. motor, $3. George Littlefield, Main St., Searsport, Maine.

FOR SALE—Supreme 581 Signal generator, one year old, never used, cost $54. Will sell for $30. or trade for new radio of about $50. value. George A. Richards, Oakley, Summit Co., Utah.

FOR SALE OR TRADE—Dodge generator 110 v. a.c., 800 watts, $12.; Carter 425A genemotor, 6/400 volts, 200 mills, $15.; Carter 420A, 12/400 v., 200 mills, $15.; both like new; Esco 1500 v., 500 mill motor generator, best offer. Irvine Doss, RFD No. 2, Happy, Texas.

FOR SALE—Dayrad tube tester, series 27, modernized 8/1/37, can be modernized again. A1 condition, $15 cash. E. H. DuFour, 13 Jewett Ave., Poughkeepsie, N. Y.

FOR SALE OR TRADE — Used telephone equipment, including several types relays, mikes, key switches, message counters, telephones, dial switches. Robert J. White, 11030 Hermosa Ave., Chicago, Ill.

FOR SALE OR TRADE — Late radio correspondence course; tube tester; Triplett No. 666, volt-ohm-milliammeter; Gernsback's manuals up to 1933 sets; miscellaneous meters, phones, parts; cheap; no reasonable offer refused.

WANTED—Standard or portable Royal, Underwood, or Corona typewriter, full keyboard. Theo. J. Geiselhart, 64 Clinton Place, East Rutherford, N. J.

WANTED—Any one of following Jewell test panels, Patterns No. 578, 579, 581 or Jewell Analyzer, Pattern No. 409. R. W. Foulkes, 317 E. 9 Mile, Ferndale, Mich.

WANTED—Pair T40, T55, 35T or similar tubes and transmitting gear.

WILL TRADE—24-volume Alexander Hamilton "Modern Business Course;" cost $150.00; perfect condition. Bill Koch, W9KUF, 1736 Sheridan, Whiting, Ind.

FOR SALE OR TRADE—$50 sun lamp with G. E. bulb, $12.00; $45 Nesco. 2-burner, pipeless oil heater, $11; $3.75 Ward Topper aerial, $1.50.

WANTED—8 or 16 mm. complete moving picture outfit; voltmeter; Rider's manuals; transceiver; telephone mike. Shor Radio Service, 2922 Violet Ave., Baltimore, Md.

WANTED—Burned out and used 110-220 volt, 60-cycle, A.C. electric motors, any size. Will pay cash or trade. Lester Thiel, 1418 Wash. St., Manitowoc, Wisc.

SELL OR TRADE—Amateur equipment, amplifiers and test equipment, radio parts and receivers.
WANTED—RCA 16mm sound camera or other 8 or 16mm cameras or projectors. Wm. Hausen, 227 Main St., Niles, Mich.

FOR SALE OR TRADE—Fan belt drive 110-volt, 60-cycle, A.C. generator for PA etc. Like new. New Visitron Photo-electric cell, four-prong. New GM relay, closes on 1 ma. of current. Guaranteed.
WANTED—Tube and set testers; meters, etc. J. Orysen, Kennan, Wisc.

FOR SALE OR TRADE—Two pocket adding machines; G. E. Sunlamp with bulb; Hand mimeograph duplicating machine. Make offer.
WANTED—Combination oscillator and ohmeter tester; Rider's, sound and short-wave equipment, or what have you? Forest Park Radio Co., 3303 Garrison Blvd., Baltimore, Md.

FOR SALE OR TRADE—One dynamotor, 24 v. input, 1500 v. d.c. output at 300 mills, with pulley, slightly used. All QST's from January 1930 to December 1938. One 32 v. Genemotor with 200 v. output, filtered for short-wave and BC reception.
WANTED—Used Super-Pro and good marine receiver. H. L. Wood, K7BZX, Box 2841, Juneau, Alaska.

FOR SALE—Supreme meter on panel, as analyzer, tests from 0-5-125, 500-1250 a.c. or d.c., 0-5-125 Ma., 0-2000-200,000 ohms,, $15.00; Gernsback Manuals 2 and 3 in A1 condition, $2.50 each. Thomas J. Kiley, Kiley's Radio Service, 31 High Street, Bridgewater, Mass.

WANTED—Will pay cash for old issues of Radio News—1919, 1920, 1922 and Electrical Experimenter, 1918 and earlier.
FOR SALE—New set of Rider Manuals, 1, 2, 3, 4, 5, 6, 7, 8, also Weston 669 V. T. Voltmeter, J. T. Lipani, 6 Ashland St., Boston, Mass.

THE READING GUIDE

(Continued from Page 12)

RADIO & TELEVISION—May 1939

99 Hudson Street,
New York, N. Y.

Transoceanic Radio Telephony on Short Waves. By Frank B Jewett. Page 5.
New Cathode-Ray Tube Modulates Light Beam. Page 9.
What About That Television Antenna? Page 17.
Getting Started in Amateur Radio. Page 19.
Electronic Television Course—How Cathode Ray Tube Works. Page 21.
DeLuxe "Beam Power 3" Transmitter. Pages 30, 31.
Remote Control Box Selects Stations From Any Spot. Pages 32 33.
Tune In Television Sound On This Converter for 2½, 5 and 10 Meters. Pages 34, 35.

RADIO TODAY—April 1939

480 Lexington Ave.,
New York, N. Y.

Let's Sell Television Right! Page 9.
New Television Receivers. Pages 12, 13.
How Television Will Be Sold. Pages 16, 17
Installation of Television Sets. Pages 18, 19.
Looking Ahead in Television. Page 20.
Auto Radio Selling Tips. Page 24.
Television Dynamic Testing. Pages 30, 31.
Selling Sound—Sales Arguments, Prospects' Requirements. Pages 43, 45.
Sound at New York World's Fair. Pages 46, 47.

* * * *

SERVICE—April 1939

19 East 47th Street,
New York, N. Y.

Looking Ahead. Pages 159-162.
Your Oscilloscope Spotlights Hum. Page 163.
Crystal Calibrators. Pages 164-166.
Dashboards Controls. Pages 168, 169.
Auto-Radio Data. Pages 172-176.
Television Servicing. Pages 180, 181.
Public Address in the Factory. Page 192.

The Effect of A. C. on Dry Electrolytic Capacitors

(Continued from Page 5)

will be proportionately even greater than the relationship shown in curve A. This procedure causes but a slight increase in physical size and cost of a given capacitor structure.

(2) The other method of insuring capacity stability is to initially form the cathode plate with an anodic film to a potential equal or greater than the maximum peak potential of the superimposed alternating current component which will actually be encountered in the intended capacitor application. This procedure naturally necessitates the use of an increased area of both anode and cathode surfaces to the extent

$$\frac{C_1 C_2}{C_1 + C_2}$$

that the relationship equals the desired capacity value. Such a resulting semi- or non-polarized capacitor structure will give absolute stability of initial capacity values but requires a material increase in physical size and cost.

It is hoped that this article will help shed some light on a subject that may not have been clearly understood by some Servicemen, design engineers and others equally interested.

Big news this month! The new line of C-D capacitor test instruments is ready! These units, incorporating the most advanced engineering design, are manufactured under the twenty-nine year C-D **Banner of Quality.**

Special offer! Limited time only! Expires Aug. 1, 1939. Convenient coupon below is worth $1 to you. Present it to your local jobber and he will allow you $1 toward the purchase price of any instrument. NOW! While reading this ad—clip coupon—you can't afford to pass up this opportunity.

If this coupon is sent to the factory it will be returned to you with the address of your nearest C-D distributor.

SPECIAL C-D FEATURES

Capacitor Analyzer. Model BF-50. The C-D Capacitor Analyzer measures capacities between .00001 and 240 mfd of all types of capacitors. Measures power-factor, 0-50%. Checks insulation resistance up to 1,500 megohms. Direct reading linear scale calibration. Push button switching. Cathode eye for bridge balance; six color coded scales. Model BF-50 complete, less tubes—List $41.50—**Net $24.90.**

Capacitor Bridge. Will accurately check capacities .00001 to 50 mfd of all type capacitors. Indicates power-factor of electrolytics. Checks for open, shorts, and high and low capacity. Can be used as a continuity meter. Direct reading ranges with all markings directly in microfarads. The C-D Capacitor Bridge is the most compact and useful instrument of its type, ever offered to the radio industry. Model BN complete, less tubes—List $16.50—**Net $9.90.**

Capacitor Decades. The C-D Capacitor Decades are the first inexpensive, practical capacitor decades ever developed. Ideally suited for experimental circuits, filter design, bridge measurements, etc. Capacity range between .0001 and 11.1 mfd available in three decades, which can be used continuously on 220 V. A. C. or 600 V. D. C. circuits. Decades supplied in attractive bakelite cases 3⅝" x 5" x 3". Model CDA-5, .011 mfd. in .0001 mfd. steps—List $9.00—**Net $5.40.**

Model CDB-5, 1.1 mfd. in .01 mfd. steps—List $9.00—**Net $5.40.**

Model CDC-5, 11.1 mfd. in 1. mfd. steps—List $16.00—**Net $9.60.**

Commercial tolerance of 5% used in above models. Tolerance of 3% available at slightly higher cost.

CORNELL-DUBILIER ELECTRIC CORPORATION
1046 Hamilton Boulevard, South Plainfield, New Jersey
Cable Address: "CORDU"

Rush this coupon! It's worth $1.00 towards purchase price of any C-D capacitor instrument.

CORNELL-DUBILIER ELECTRIC CORPORATION
South Plainfield, New Jersey

Please rush the following material:

- ☐ Catalog No. 167A on Capacitor Instruments
- ☐ Catalog No. 165A on complete C-D line of Capacitors
- ☐ Catalog No. 166A on Quietone Interference Filters
- ☐ Place me on your mailing list for free C-D House Organ

NAME.....

ADDRESS.....

CITY.....STATE.....